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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/532,892	03/22/2000	Makoto Sasaki	00USFP465-M.K.	8015

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EXAMINER

BROCK II, PAUL E

ART UNIT PAPER NUMBER

2815

DATE MAILED: 09/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/532,892

Applicant(s)

SASAKI, MAKOTO

Examiner

Paul E Brock II

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7, 15-24 and 26-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7, 15-24 and 26-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 March 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 25 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear what “wherein said cross section includes at least a portion of said cross section,” means. Why wouldn’t the cross section include a portion of the cross section?

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1 – 5, 17 – 23 and 26 – 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Stamper (USPAT 6111301).

With regard to claim 1, Stamper discloses in figure 4 and column 3, lines 7 – 20 a semiconductor memory device, including a copper fuse section (2) that is oxidized by a laser

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beam in an oxidizing environment.. Stamper discloses in figure 4 and column 3, lines 7 – 20 a dielectric film (8), including a first film section (bottom 8), a second film section (bottom half of the middle 8 and the left and right 8's) formed on the first film section, and a third film section (top half of the middle 8) formed over the second film section. Stamper discloses in figure 4 and column 3, lines 7 – 20 a wiring line structure (6). Stamper discloses in figure 4 and column 3, lines 7 – 20 a first (left 3 and 6) and a second (right 3 and 6) wiring line, each of the first and second wiring lines formed directly upon the second film section of the dielectric film without an intervening film therebetween and extending in an opposite direction. Stamper discloses in figure 4 and column 3, lines 7 – 20 said copper fuse section formed on the first film section of the dielectric film, an end of the copper fuse section being directly connected to the first wiring line by a first section of the first wiring line which penetrates a portion of the second film section, and another end of the copper fuse being directly connected to the second wiring line by a second section of the second wiring line, which penetrates a portion of the second film section. Stamper discloses in figure 4, column 1 lines 29 – 37, and column 3, lines 7 – 20 an opening formed in the third and second film sections of the dielectric film and between the first and second wiring lines, wherein the opening provides access to the laser beam to oxidize the copper fuse section in the oxidizing environment.

With regard to claim 2, Stamper discloses in column 2, lines 60 – 61 wherein the dielectric film inherently has a thermal endurance of 350 °C or above. This is an inherent property of silicon dioxide.

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With regard to claim 3, Stamper discloses in column 2, lines 60 – 61 wherein the dielectric film has a relative dielectric constant equal to or lower than 4. This is an inherent property of silicon dioxide.

With regard to claims 4 and 5, Stamper discloses in column 2, line 56 wherein at least one of the first wiring line, the first section of the first wiring line, the second wiring line, and the second section of the second wiring line includes copper.

With regard to claim 17, Stamper discloses in figure 2 and column 1, lines 13 – 35 a semiconductor device including a copper fuse, the copper fuse being programmed to a high resistance state by oxidation, wherein the high resistance state results from a cross section of the copper fuse being oxidized in an oxygen atmosphere to copper oxide.

With regard to claim 18, Stamper discloses in column 2, lines 60 – 61 wherein the dielectric film inherently has a thermal endurance of 350 °C or greater. This is an inherent property of silicon dioxide.

With regard to claim 19, Stamper discloses in column 2, lines 60 – 61 wherein the dielectric film has a relative dielectric constant equal to or lower than 4. This is an inherent property of silicon dioxide.

With regard to claim 20, Stamper discloses in figure 4 a dielectric film including a first film section formed over a substrate, a second film section formed on the first film section, and a third film section formed on the second film section. Stamper discloses in figure 4 a first wiring line and a second wiring line, each of the first wiring line and the second wiring line being formed on the second film section of the dielectric film. Stamper discloses in figure 4 and column 1, lines 13 – 35 the copper fuse formed on the first film section of the dielectric film, an

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end of the copper fuse being directly connected to the first wiring line by a first section of a first wiring line, which penetrates a portion of the second film section, and another end of the copper fuse being directly connected to the second wiring line by a second section of the second wiring line, which penetrates a portion of the second film section, and the copper fuse being programmed to a high resistance state by oxidation. Stamper discloses in figure 4 and column 1, lines 13 – 35 an opening formed in the third and second film sections of the dielectric film and between the first wiring line and the second wiring line. Stamper discloses in figure 4 and column 1, lines 13 – 35 wherein the high resistance state results from a cross section of the copper fuse being oxidized to copper oxide and the cross section is located in the opening.

With regard to claim 21, Stamper discloses in column 2, lines 60 – 61 wherein the dielectric film inherently has a thermal endurance of 350 °C or greater. This is an inherent property of silicon dioxide.

With regard to claim 22, Stamper discloses in column 2, lines 60 – 61 wherein the dielectric film has a relative dielectric constant equal to or lower than 4. This is an inherent property of silicon dioxide.

With regard to claim 23, Stamper discloses in column 2, line 56 wherein at least one of the first wiring line, the first section of the first wiring line, second wiring line and the second section of the wiring line includes copper.

With regard to claim 26, Stamper discloses in figure 4 and column 1, lines 13 – 35 a semiconductor device comprising a copper fuse, the copper fuse being programmed to a high resistance state by oxidation, wherein the copper fuse comprises a portion being pinched off with copper oxide.

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With regard to claim 27, Stamper discloses in figure 4 and column 1, lines 13 – 35 wherein the copper fuse is formed on a dielectric film that has a thermal endurance of 700° C.

With regard to claim 28, Stamper discloses in figure 4 and column 1, lines 13 – 35 wherein the copper fuse is formed on a dielectric film that has a relative dielectric constant equal to 4.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 7, 15 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stamper as applied to claim 1 and 20 above, and further in view of Huang et al. (USPAT 6162686, Huang).

Stamper is silent on a third wiring line formed of copper on the first dielectric film. Huang teaches in figure 5 and column 6, lines 20 – 22 a semiconductor memory device that comprises a wiring line (44(M2)) formed on a first section of a first dielectric film (30). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the wiring line of Huang in the device of Stamper in order to connect devices together as stated by Huang in column 4, lines 25 – 35.

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With regard to claim 15, Huang teaches in figure 5 and column 6, lines 20 – 22 wherein the wiring line includes copper.

7. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stamper and Huang as applied to claims 1 and 7 above, and further in view of Shih et al. (USPAT 6100118, Shih).

With regard to claim 16, Stamper and Huang are silent to the teaching that the wiring line is disposed parallel to a wiring line structure. Shih teaches in figure 3 wherein a wiring line (42) is disposed parallel to a wiring line structure (31a and 31b). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the parallel lines of Shih in the device of Stamper and Huang in order to have extensive interconnections on each wiring layer.

Response to Arguments

8. Applicant's arguments filed September 5, 2002 have been fully considered but they are not persuasive.

9. With regard to the applicant's arguments suggesting that a direct connection can not be made through a corrosion barrier layer, it should be noted that the corrosion barrier layers of Stamper are part of the direct connection between the copper fuse and the first and second wiring lines. A direct connection of Stamper comprises a direct electrical connection from the first and second wiring lines to the copper fuse. The pending claims fail to distinguish over this direct

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electrical connection of Stamper. Therefore, the arguments are not persuasive, and the rejection is proper.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703)308-6236. The examiner can normally be reached on 8:30 AM-5:30 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703)308-1690. The fax phone numbers for the

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organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
September 25, 2002



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800